

REMARKS

The Office examined claims 1-10 and rejected same. With this paper, claim 7 is amended and new claim 11 is added. The application now includes 11 claims.

Claim Rejections under 35 USC §102(b) or §103(a)

At page 2, section 1 of the Office Action, claims 1 to 4 are rejected under 35 USC §102(b) as anticipated by or, in the alternative, under 35 USC §103(a) as obvious over Shigeki (JP08-283313).

The Office states that Shigeki discloses a dispersion stabilizer for suspension polymerization of vinyl compound, comprising a polyvinyl alcohol of which the absorbance at 280 nm (A) is 0.1 or higher, the absorbance at 320 nm (B) is 0.03 or higher, and the ratio of absorbance A to absorbance B is lower than 0.3, and in which the block character of residual acetic acid groups is 0.4 or higher.

Applicant respectfully submits that, the Office's assertion that Shigeki teaches the ratio of absorbance A (at 280 nm) to absorbance B (at 320 nm) is lower than 0.3 is based on a mistranslation of PATENT ABSTRACTS OF JAPAN of JP08-283313.

The original Abstract of JP08-283313 discloses that:

“280 nmの吸光度 (a) が 0.1 より大であり 320 nmの吸光度 (b) が 0.03 以上であり、吸光度 (b) /吸光度 (a) が 0.3 未満である”

The correct translation of the above section is that the ratio of absorbance B (320nm) to absorbance A (280nm) is lower than 0.3. This would also be apparent from the machine translation of JP08-283313 at page 2, paragraph [0007], wherein it is disclosed that absorbance (B) at 320nm/absorbance (A) at 280nm is less than 0.3.

Since the ratio of absorbance at 320 nm to absorbance at 280 nm recited in claim 1 is at least 0.3 (≥ 0.3) while what Shigeki discloses is that the absorbance ratio A_{320}/A_{280} is lower than 0.3 (< 0.3), the limitation of claim 1 does not overlap with Shigeki.

As disclosed in the instant specification, the carbonyl group-containing polyvinyl

alcohol resin used as a dispersing agent has the following features: the block character of remaining fatty acid ester groups is at least 0.5, the absorbance at each of 215 nm, 280 nm and 320 nm is at least 0.1, and the absorbance ratio A_{320}/A_{280} is at least 0.3.

As discussed in the specification at page 17, line 26 to page 18, line 1, if the A_{320}/A_{280} ratio is less than 0.3, the emulsifying ability is lowered, and, on the other hand, if the A_{320}/A_{280} ratio is too high, foaming may occur in suspension polymerization of vinyl compounds. Also, as discussed in the specification at page 18, lines 2-6, if the block character is less than 0.5, the foaming suppression effect is lowered.

As it is shown in Tables 3 and 4 in the specification, the polyvinyl alcohol resins according to the present invention which have a block character of at least 0.5 and an A_{320}/A_{280} ratio of at least 0.3 exhibit excellent polymerization stabilizing effect and excellent foaming suppression effect.

Shigeki discloses a dispersing stabilizer having an excellent antifoaming effect. Shigeki discloses a dispersing stabilizer for suspension polymerization of vinyl compounds comprising a polyvinyl alcohol resin having a block character of remaining acetic acid groups of at least 0.4 and having an absorbance (a) of at least 0.1 at 280 nm and an absorbance (b) of at least 0.03 at 320 nm measured by ultraviolet absorption spectrum of a 0.1 % by weight aqueous solution of the polyvinyl alcohol resin, wherein the absorbance (b)/(a) ratio is less than 0.3.

Shigeki teaches that the absorbance ratio A_{320}/A_{280} is less than 0.3, 0.25 or less are desirable, and 0.2 or less are still more desirable (see page 3, paragraph [0009] of the partial English translation of JP08-283313). Further, Comparative Example 2 of Shigeki clearly demonstrates that if the absorbance ratio is 0.35, the polymerization stability is poor and the foaming suppression effect is also poor. As stated above, Shigeki does not provide any teaching or suggestion that motivates a person skilled in the art to produce a polyvinyl alcohol resin having an absorbance (b)/(a) ratio of 0.3 or higher.

As discussed in the instant specification at page 4, lines 6-12, the dispersing agent as taught in Shigeki has the problems that the function as a protective colloid is insufficient and,

therefore, coarse particles are produced in the suspension polymerization of vinyl chloride.

Therefore, the teachings of Shigeki cannot lead a person skilled in the art to use a polyvinyl alcohol resin having an absorbance ratio A_{320}/A_{280} of at least 0.3 as a dispersing stabilizer for suspension polymerization of vinyl compounds.

Based on the foregoing, claim 1 is believed to be patentable in view of Shigeki. Applicant respectfully requests the rejections of claim 1 be reconsidered and withdrawn.

Claims 2-4 depend from claim 1. Since claim 1 is believed to be patentable, claims 2-4 are also patentable. Applicant respectfully requests the rejections of claims 2-4 under 35 USC 102(b) or 103(a) be reconsidered and withdrawn.

Claim Rejection under 35 USC §103(a)

At page 3, section 3 of the Office Action, claims 5-10 are rejected under 35 USC 103(a) as being unpatentable over Shigeki (JP08-283313) in view of Tokita (US Patent No. 6,448,321B1).

With respect to the preparation of dispersing agent by melt-extruding or melt-kneading the polyvinyl alcohol resin as claimed in claims 6 and 7, the Examiner states that Shigeki does not teach the use of an extruder for melt-kneading and melt-extruding, but asserts that Tokita teaches a method of melt-kneading to produce a melt-kneaded product (col. 4, lines 21-34 of Tokita) by a kneader or a multi-screw extruder (col. 8, lines 6-7 of Tokita). The Examiner further states that since the advantage of using melt kneading is to neutralize at least a part of fatty acid or saponify at least a part of fatty acid ester (col. 4, lines 30-34 of Tokita), it would have been obvious to include the step of melt-kneading by extruder of Tokita in the process of Shigeki in order to obtain the aforementioned advantages.

Applicant respectfully submits that, the disclosure of Tokita is directed to an aqueous dispersion of a thermoplastic resin suitable as an aqueous coating material. The aqueous dispersion comprises (A) a thermoplastic resin, (B) a salt of a fatty acid, and (C) water, or the aqueous dispersion comprises (A) a thermoplastic resin, (B) a salt of a fatty acid, (B') a fatty

acid and/or an ester of a fatty acid, and (C) water. Tokita discloses that the aqueous dispersion is prepared by a process that comprises the steps of melt kneading (A) a thermoplastic resin and (B') a fatty acid and/or a fatty acid ester, adding a basic substance such as potassium hydroxide and (C) water to the resulting melt kneaded product, and further melt kneading the mixture to thereby neutralize at least a part of the fatty acid and/or saponify at least a part of the fatty acid ester simultaneously with dispersing the solid matter into the aqueous phase. Or, the process comprises the steps of preliminarily neutralizing or saponifying the fatty acid and/or a fatty acid ester (B') with a basic substance, melt kneading the neutralized/saponified product with the thermoplastic resin (A), adding water to the resulting melt kneaded product, and further melt kneading the mixture to form an aqueous dispersion (column 4, lines 21-34, and column 7, line 60 to column 8, line 3, both of Tokita). Tokita teaches that the melt kneading is conducted in order to neutralize a fatty acid and/or hydrolyze a fatty acid ester, or to disperse the solid matter into water to form an aqueous dispersion. In the former process, the melt kneading is conducted in order to form a fatty acid salt, which serves as a dispersing agent for dispersing the thermoplastic resin into water, from a fatty acid and/or a fatty acid ester with a basic substance such as an alkali metal hydroxide. Tokita does not teach a thermoplastic resin is modified by melt-kneading. Since Tokita is directed to a manner of dispersing a thermoplastic resin into water to form an aqueous dispersion of the thermoplastic resin, the teachings of Tokita would not lead a person skilled in the art to apply the melt-kneading step of Tokita to polyvinyl alcohol (= hydrolyzed polyvinyl acetate) of Shigeki so as to further modify it.

Therefore, even if Shigeki is combined with Tokita, the processes as claimed in claims 6 and 7 are not obvious with regard to Shigeki in view of Tokita.

The present invention discloses a dispersing agent for suspension polymerization of vinyl compounds such as vinyl chloride. Normally, in suspension polymerization of vinyl chloride, wet foam caused by polyvinyl alcohol used as a dispersing agent for the suspension polymerization and dry foam composed mainly of vinyl chloride resin particles may generate. It is known in the art to use a polyvinyl alcohol resin having conjugated double bonds as a dispersing agent for the suspension polymerization. The known dispersing agents have

problems such as the heat treatment of polyvinyl alcohol resins or carbonyl group-containing polyvinyl alcohol resins to introduce conjugated double bonds have to be conducted at high temperatures for a long time, e.g. at 150°C for several hours, thus increasing the production cost, and the resulting vinyl polymers have a wide particle size distribution.

The present invention provides a dispersing agent capable of suppressing foaming in suspension polymerization of vinyl compounds and capable of producing vinyl polymers having excellent properties and a narrow particle size distribution by an economical method. The present invention is based on the discovery that conjugated double bonds can be uniformly introduced into polyvinyl alcohol resins in a short time by heat treating carbonyl group-containing polyvinyl alcohol resins in way of melt-kneading. The resulting polyvinyl alcohol resins have a high surface activity and can suppress the foaming that occurs during the polymerization.

According to the presently claimed invention, a double bond is introduced through the acetic acid elimination reaction in the presence of sodium acetate catalyst in the molten state, whereby a block character of the residual acetic acid group is lowered.

Shigeki discloses that a polyvinyl alcohol resin having a block character of at least 0.4 is prepared by acid hydrolysis of a vinyl ester polymer prepared by radical polymerization of a vinyl ester monomer in the presence of a carbonyl group-containing compound such as acetaldehyde or butylaldehyde, or by alkali hydrolysis of the vinyl ester polymer followed by heat treatment of the alkali hydrolysis product. Shigeki does not disclose any detail about how to conduct the heat treatment, but Shigeki discloses in an Example that after drying an alkali hydrolysis product at 60°C and purifying it by Soxhlet washing with methanol for 10 hours, it was heat-treated in a hot air dryer at 150°C for 4 hours in an air atmosphere. Shigeki also discloses that the polyvinyl alcohol resins obtained in other Examples were prepared by changing the heat-treating temperature and time in the hot air dryer. Thus, Shigeki teaches that the heat treatment is conducted by heating a carbonyl group-containing polyvinyl alcohol at a high temperature in the vicinity of 150°C for several hours.

In Shigeki, the heat treatment in the Example is conducted in the hot air dryer at 150°C in an air atmosphere. It should be understood that at 150°C the polyvinyl alcohol is

not molted, and thus if the acetic acid elimination reaction is initiated, the reaction could only be conducted in the solid state, which may produce a water insoluble matter in the polyvinyl alcohol by thermal decomposition.

The Examiner states that since Tokita teaches that the advantage of using melt-kneading is to neutralize at least a part of fatty acid or saponify at least a part of fatty acid ester, it would have been obvious to include the step of melt-kneading by extruder of Tokita in the process of Shigeki in order to obtain the aforementioned advantages.

However, as discussed above, the teaching of Tokita is to form a fatty acid salt (surfactant) which serves as a dispersing agent for dispersing a thermoplastic resin into water by melt kneading the thermoplastic resin with a fatty acid and/or a fatty acid ester in the presence of a basic substance such as potassium hydroxide. Therefore, a person skilled in the art would not be motivated to apply the melt-kneading of Tokita to the heat treatment of a polyvinyl alcohol resin disclosed in Shigeki in order to achieve the results of the present invention.

Also, as discussed at page 5, line 23 to page 6, line 4 of the instant specification, it is difficult to prepare a polyvinyl alcohol resin having a block character of 0.5 or more by a conventional heat treatment process as taught by Shigeki. In contrast, a polyvinyl chloride resin having a block character of 0.5 or more can be very easily produced in a very short time by the presently claimed process, i.e. by conducting the acetic acid elimination reaction in the molten state, as apparent from the Examples in the specification. When the block character is at least 0.5, preferably at least 0.55, the degree of randomness in distribution of fatty acid vinyl ester units in the PVA resin is high and, as a result, a high foaming suppression effect is exhibited, as disclosed in the specification at page 16, lines 20-25 and page 18, lines 2-6. Further, as disclosed in the specification at page 16, line 25 to page 17, line 2, production of insoluble matter can be decreased, since the reaction is conducted in an extruder. It is believed that these results are not expected from Shigeki and Tokita.

In light of the above, it is believed that the melt-kneading and melt-extruding processes claimed in the present invention is not obvious from Shigeki alone or in combination with Tokita. The results as achieved by the melt-kneading and the melt-

extruding in the present invention are not expected from Shigeki in view of Tokita.

With this paper, claim 7 is amended to become a dependent claim of claim 1. Newly added claim 11, also a dependent claim of claim 1, further restricts the absorbance ratio to 0.45 to 1.5 based on the disclosure in page 17, lines 24-25 of the instant specification. Since claim 1 is patentable as stated above, all other claims in this application, being dependent directly or indirectly from claim 1, should be patentable as well. Applicant respectfully requests the rejections of claims 5-10 under 35 USC 103(a) be reconsidered and withdrawn.

Conclusion

For all the foregoing reasons, it is believed that all of the claims of the instant application are patentable, and their passage to issue is earnestly solicited. Applicant's agent urges the Examiner to call to discuss the present response if anything in the present response is unclear or unpersuasive.

Respectfully submitted,



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